Assignment - 1

High Speed Network

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Submitted By:-

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B.Tech (C.S.E.) IVth Year

Q.1 Explain Frame relay networks.

Ans. Frame Relay is a packet switching technology that is fragmented into transmission units called frames and sent in high-speed bursts through a digital network.

It establishes an exclusive connection during the transmission period called virtual connection.

It uses a technology called fast packet in which error checking does not occur in any intermediate node of the transmission but done at the ends.

It makes it more efficient than X.25, and a higher process speed is achieved (it can transmit over 2,044 Mbps).

Another advantage of this network is that we need less powerful switching centers (nodes) and with less memory capacity than those needed by X25 (each X25 switching center uses the receive-store-check-relay method, while Frame Relay does not need checking or correcting errors).

If the traffic is hefty, with a large number of small packages, its performance is more excellent than X25.

If large files are transferred at high speeds, the price/performance ratio is higher in X25.

Frame relay has evolved from X.25 packet switching and its objective is to reduce network delays, protocol overheads and equipment cost.

Error correction is done on an end-to-end basis rather than a link -to-link basis as in X.25 switching.

Frame relay can support multiple users over the same line and can establish a permanent virtual circuit or a switched virtual circuit.

Q.2 Explain ATM PROTOCOL ARCHITECTURE.

Ans. Asynchronous Transfer Mode (ATM) is an International Telecommunication Union- Telecommunications Standards Section (ITU-T) efficient for call relay and it transmits all information including multiple service types such as data, video or voice which is conveyed in small fixed size packets called cells.

Cells are transmitted asynchronously and the network is connection oriented. ATM is a technology which has some event in the development of broadband ISDN in the 1970s and 1980s, which can be considered an evolution of packet switching.

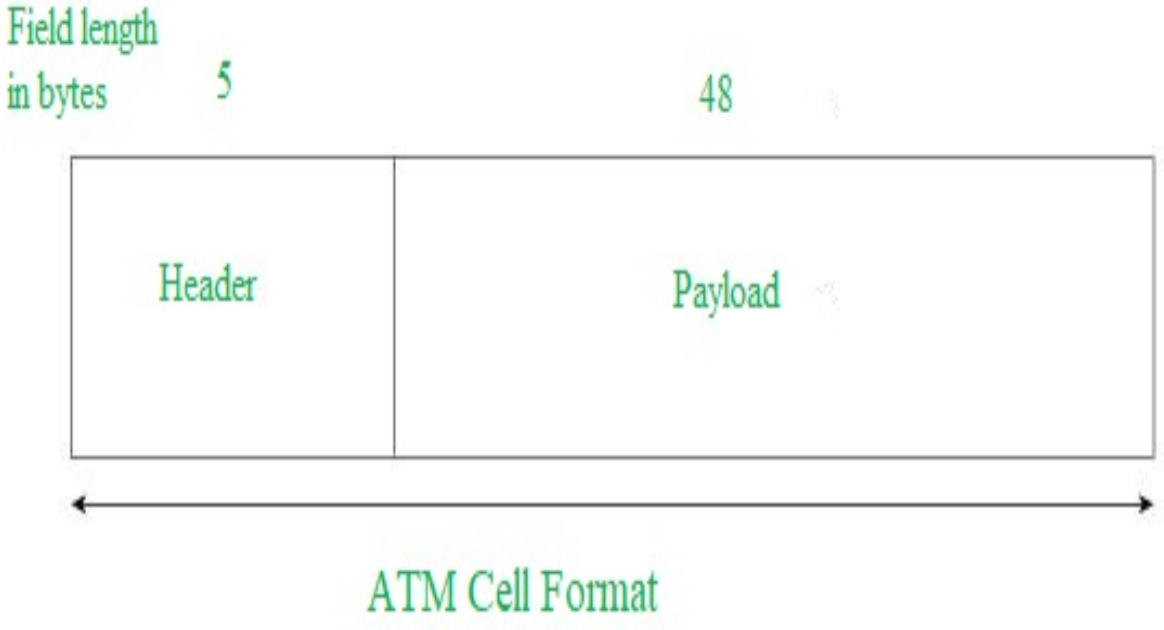
Each cell is 53 bytes long – 5 bytes header and 48 bytes payload. Making an ATM call requires first sending a message to set up a connection. Subsequently all cells follow the same path to the destination. It can handle both constant rate traffic and variable rate traffic. Thus it can carry multiple types of traffic with end-to-end quality of service.

ATM is independent of transmission medium, they may be sent on a wire or fiber by themselves or they may also be packaged inside the payload of other carrier systems.

ATM networks use “Packet” or “cell” Switching with virtual circuits. It’s design helps in the implementation of high performance multimedia networking.

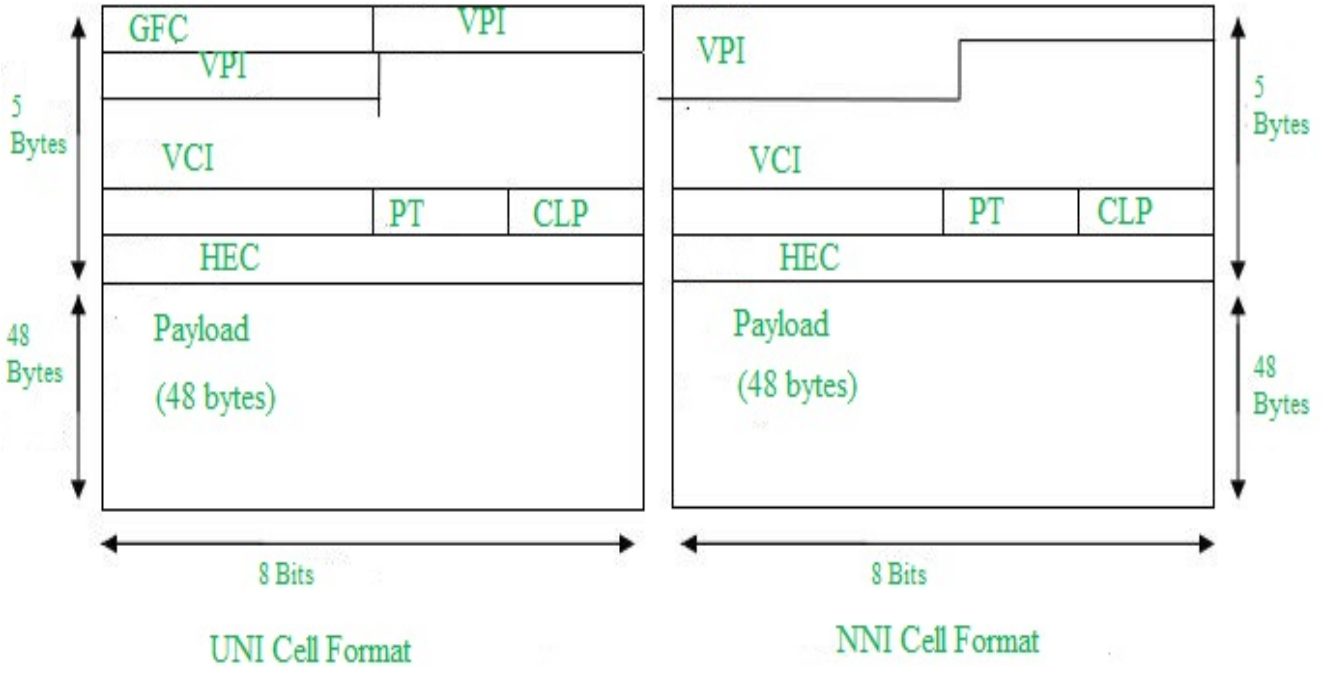
ATM Cell Format –

As information is transmitted in an ATM in the form of fixed size units called cells, each cell is 53 bytes long which consists of 5 bytes header and 48 bytes payload.



Asynchronous Transfer Mode can be of two format types which are as follows:

1. UNI Header
2. NNI Header



1. **UNI Header:** which is used within private networks of ATM for communication between ATM endpoints and ATM switches. It includes the Generic Flow Control (GFC) field.
2. **NNI Header:** is used for communication between ATM switches, and it does not include the Generic Flow Control(GFC) instead it includes a Virtual Path Identifier (VPI) which occupies the first 12 bits.

Working of ATM:

ATM standard uses two types of connections. i.e., Virtual path connections (VPCs) which consist of Virtual channel connections (VCCs) bundled together which is a basic unit carrying a single stream of cells from user to user. A virtual path can be created end-to-end across an ATM network, as it does not route the cells to a particular virtual circuit. In case of major failure all cells belonging to a particular virtual path are routed the same way through the ATM network, thus helping in faster recovery.

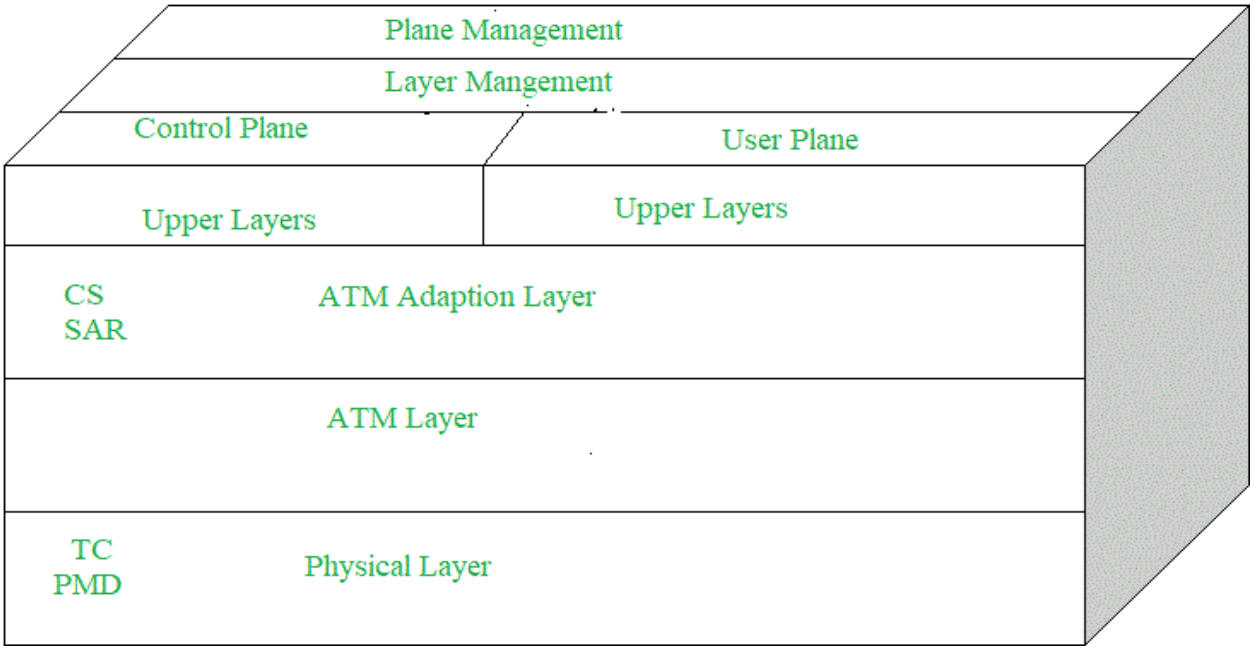
Switches connected to subscribers use both VPIs and VCIs to switch the cells which are Virtual Path and Virtual Connection switches that can have different virtual channel connections between them, serving the purpose of creating a *virtual trunk* between the switches which can be handled as a single entity. It's basic operation is straightforward by looking up the connection value in the local translation table determining the outgoing port of the connection and the new VPI/VCI value of connection on that link.

ATM Applications:

1. **ATM WANs –** It can be used as a WAN to send cells over long distances, a router serving as an end-point between ATM network and other networks, which has two stacks of protocol.
2. **Multimedia virtual private networks and managed services –** It helps in managing ATM, LAN, voice and video services and is capable of full-service virtual private-networking, which includes integrated access to multimedia.
3. **Frame relay backbone –** Frame relay services are used as a networking infrastructure for a range of data services and enabling frame relay ATM service to Internetworking services.
4. **Residential broadband networks –** ATM is by choice provides the networking infrastructure for the establishment of residential broadband services in search for highly scalable solutions.
5. **Carrier infrastructure for telephone and private line networks –** To make more effective use of SONET/SDH fiber infrastructures by building the ATM infrastructure for carrying the telephonic and private-line traffic.

Q.3. What is an ATM and Adoption layer?

Ans. ATM Layers:



1. **ATM Adaption Layer (AAL) –** It is meant for isolating higher layer protocols from details of ATM processes and prepares for conversion of user data into cells and segments it into 48-byte cell payloads. AAL protocol excepts transmission from upper layer services and help them in mapping applications, e.g., voice, data to ATM cells.
2. **Physical Layer –** It manages the medium-dependent transmission and is divided into two parts physical medium-dependent sublayer and transmission convergence sublayer. Main functions are as follows:
    - It converts cells into a bit stream.
    - It controls the transmission and receipt of bits in the physical medium.
    - It can track the ATM cell boundaries.
    - Look for the packaging of cells into appropriate types of frames.

3. **ATM Layer –** It handles transmission, switching, congestion control, cell header processing, sequential delivery, etc., and is responsible for simultaneously sharing the virtual circuits over the physical link known as cell multiplexing and passing cells through ATM network known as cell relay making use of the VPI and VCI information in the cell header.

Q.4 Explain AAL1 and AAL 2?

Ans. **AAL TYPE1**:-

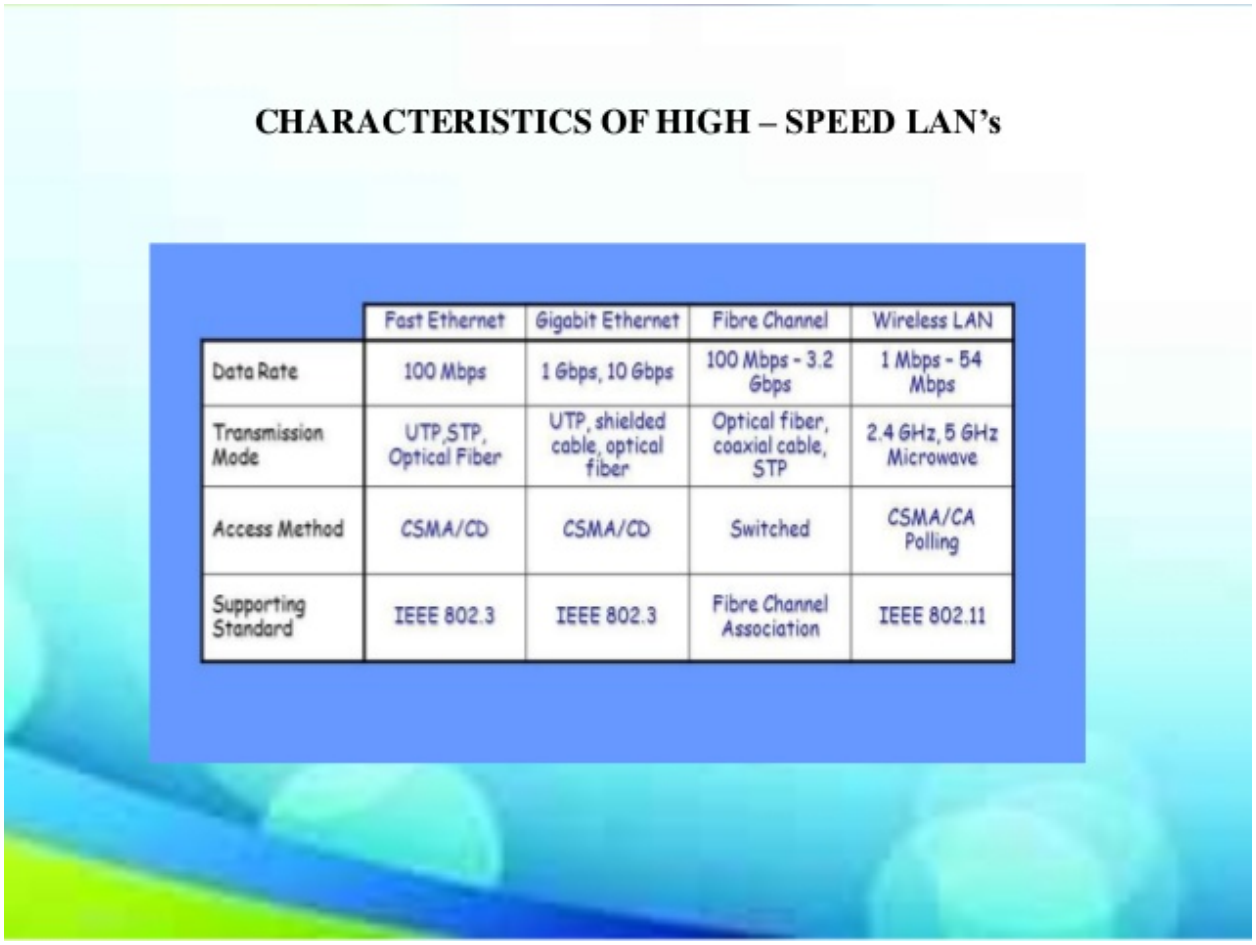
1. It is dealing with CBR sources.
2. SAR packs the bits into cells for transmission and unpacks bits at r.ption.
3. Block accompanied by sequence number so that error PDUs(Protocol Data Unit) are tracked.
4. 4 bit SN field consists of a convergence sub layers indicator(CSI) bit &3 bit SequenceCount(SC).
5. Sequence Number Field(SNF) is an error code for error detection and possibly correction on the sequence number field.

AAL TYPE2:-

1. It deals with VBR.
2. It is used in Analog applications.

Q.5 What do you mean by High speed LAN?

Ans. Since the computing power of PCs was growing rapidly, 10 Mbps Ethernet and 16 Mbps token ring was not up to the mark for transferring potentially large volumes of data. This demanded the need of High Speed LANs.



Examples of High Speed LANs:-

1. Centralized server farms.
2. Power workgroups.
3. High-speed local backbone.

Q.6 Explain Fiber Channel?

Ans. Fibre Channel is a high-speed network technology used to connect servers to data storage area networks.

It handles high performance of disk storage for applications on many corporate networks.

It supports data backup and replication.

Fibre Channel is needed, as it is very flexible and enables the transfer of data at a faster speed.

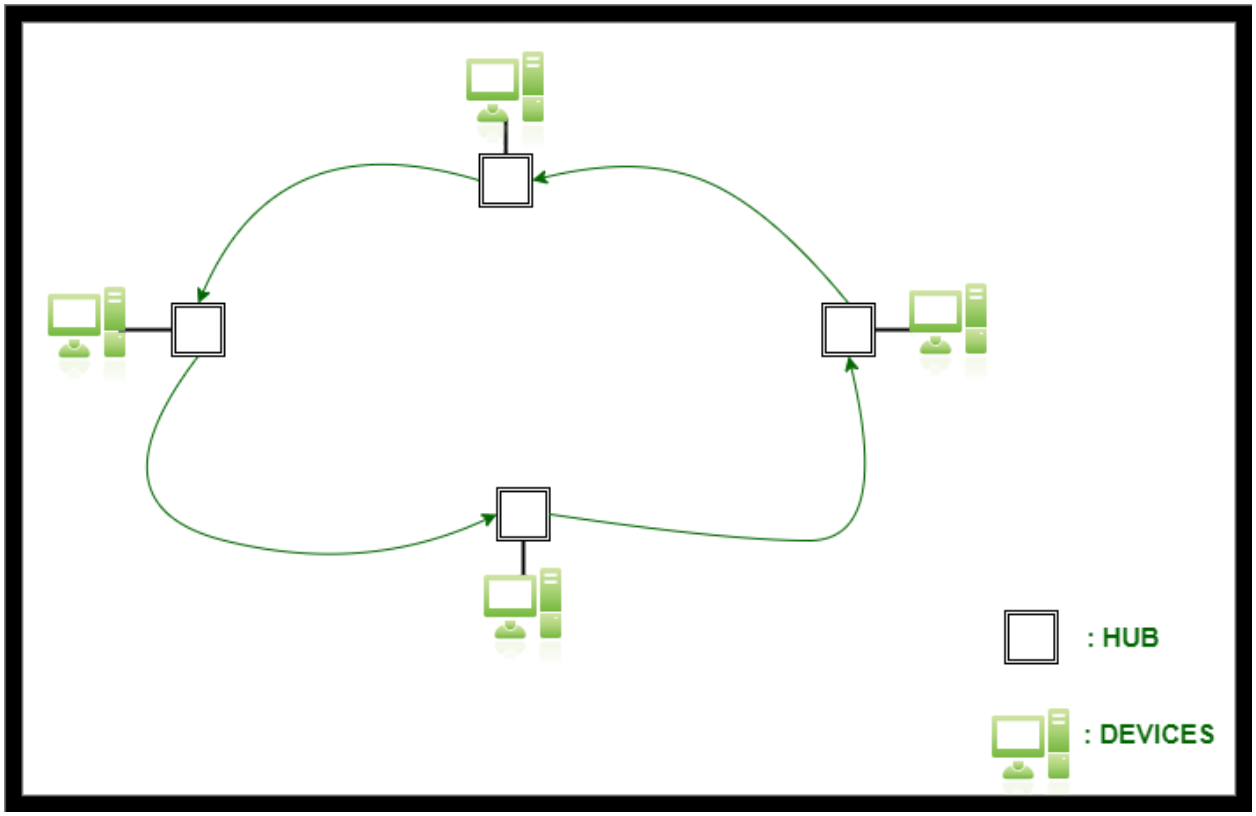
The topologies, that bring about the flexibility in the fibre channel are –

1. Point to point topology.
2. Fibre channel arbitrated loop.
3. Switched fabric topology.

Point to point topology:-

- A single link connects two ports in this topology.
- This topology is inexpensive but it doesn't require a hub.
- To create point to point configuration, you can provide multiple 'N' ports on each node.
- Each point to point connection provides the full bandwidth supported by 'N' ports. Depending on the type of the link (multi-mode or single-mode fiber), the two nodes can be separated by up to 500m (multi-mode fiber) or 10km (single-mode fiber).

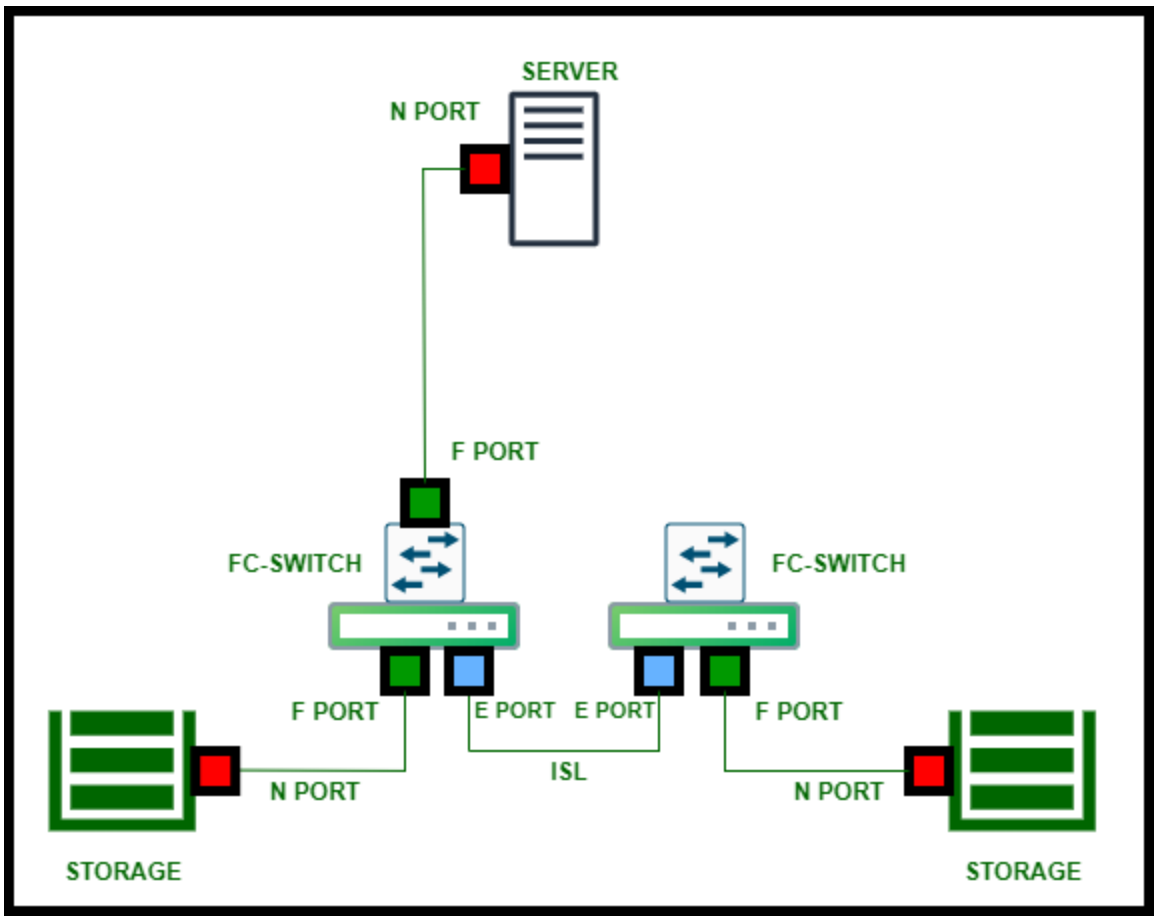
Fibre channel arbitrated loop topology [FC-AL]:-



- It is a high-speed fibre channel [FC] topology in which fibre channel ports/hubs use arbitration to establish a point-to-point circuit and prevent multiple ports/hubs from sending frames at the same time.
- Here devices are connected in a one-way ring. So, when ports/hubs in a loop topology have information to transmit, they must send out an arbitration signal to decide, which port/hub can use the channel. The port in control of the channel then sends an ‘open’ arbitrated signal to the destination port and transmits its information. Since all the ports in the loop are connected, every port will see and pass along the data, but ignore the data unless it is addressed to that particular port.
- FC-AL can join up to 126 ports on one controller.
- It is still used internally in many fibre channel switches but rarely to connect hosts to storage these days.

- FC- hubs provide bypass circuits that prevent the loop from breaking if one device fails or is removed.

Switched Fabric Topology:-



- This is the topology that is very much in use nowadays.
- The network of switches in a fibre channel habitat is referred to as a fabric.
- Ports on one node can communicate with ports on other nodes attached to the same fabric. With the fabric topology, many connections can be alert at a time.
- The any-to-any connection service and peer-peer communication service provided by a fabric is fundamental to fibre channel

architecture. Fibre channel can hold-up both channel and network protocol simultaneously.

Q.7 What are The LANs Applications requirements?

Ans. Following are the LAN requirements:-

1. Throughput
2. Number of nodes
3. Connection to backbone
4. Service area
5. Battery power consumption
6. Transmission robustness and security
7. Collocated network operation
8. License-free operation
9. Handoff / roaming
10. Dynamic configuration

Q.8 Explain IEEE 802.11 SERVICES?

Ans. Following are the IEEE 802.11 Services:-

1. Association
2. Reassociation
3. Disassociation
4. Authentication
5. Privacy

Q.9 Explain Architecture of 802.11?

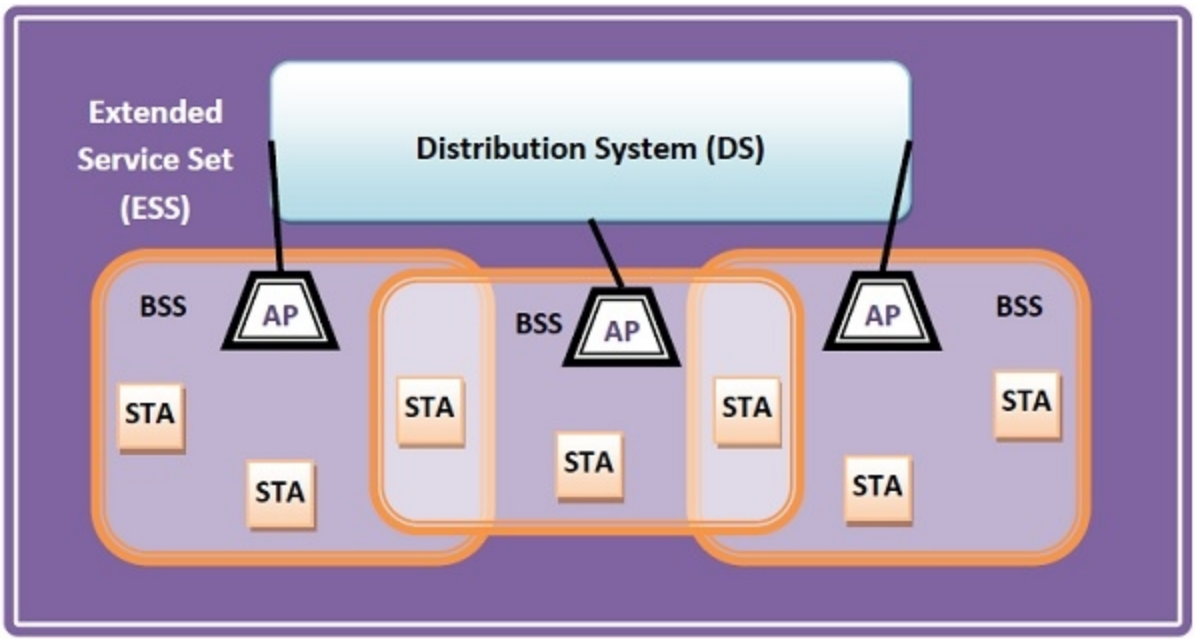
Ans. IEEE 802.11 standard, popularly known as WiFi, lays down the architecture and specifications of wireless LANs (WLANs). WiFi or WLAN uses high-frequency radio waves instead of cables for connecting the devices in LAN. Users connected by WLANs can move around within the area of network coverage.

IEEE 802.11 Architecture:-

The components of an IEEE 802.11 architecture are as follows −

- **Stations (STA) −** Stations comprises all devices and equipment that are connected to the wireless LAN. A station can be of two types−
    - Wireless Access Point (WAP) − WAPs or simply access points (AP) are generally wireless routers that form the base stations or access.
    - Client. Clients are workstations, computers, laptops, printers, smartphones, etc.
- Each station has a wireless network interface controller.
- **Basic Service Set (BSS) −** A basic service set is a group of stations communicating at the physical layer level. BSS can be of two categories depending upon the mode of operation−
    - Infrastructure BSS − Here, the devices communicate with other devices through access points.
    - Independent BSS − Here, the devices communicate in a peer-to-peer basis in an ad hoc manner.
- **Extended Service Set (ESS) −** It is a set of all connected BSS.

- **Distribution System (DS)** − It connects access points in ESS.



Q.10 Explain Fast Ethernet, Gigabit Ethernet?

Ans. Ethernet are several types:

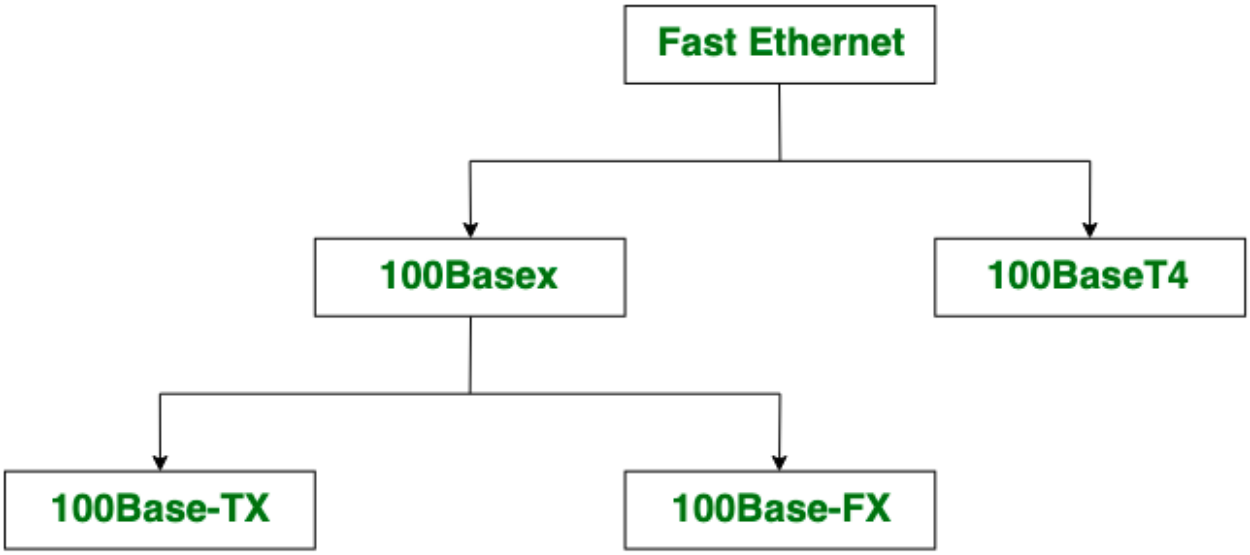
1. Fast Ethernet
2. Gigabit Ethernet
3. Switch Ethernet

Fast Ethernet is the Successor of 10-Base-T Ethernet. It is more popular than Gigabit Ethernet because its configuration and implementation is simple. It is faster than its successors. Its variants are:

1. 100Base-T4
2. 100Base-Tx
3. 100Base-Fx

The coverage limit of Fast Ethernet is up to 10 km and its round-trip delay in Fast Ethernet is 100 to 500 bit times.

Gigabit Ethernet is the successor of Fast Ethernet. It can produce up to 1 Gbps speed. It is less popular than Fast Ethernet because its configuration and implementation is complicated than Fast Ethernet. The coverage limit of Gigabit Ethernet is up to 70 km.



Categories of Fast Ethernet

S.NO	Fast Ethernet	Gigabit Ethernet
1.	Fast Ethernet provides 100 Mbps speed.	Gigabit Ethernet offers 1 Gbps speed.
2.	Fast Ethernet is simply configured.	While Gigabit Ethernet is more complicated than Fast Ethernet.
3.	Fast Ethernet generates more delay comparatively.	Gigabit Ethernet generates less delay than Fast Ethernet.

4.	The coverage limit of Fast Ethernet is up to 10 km.	While the coverage limit of Gigabit Ethernet is up to 70 km.
5.	The round-trip delay in Fast Ethernet is 100 to 500 bit times.	While the round-trip delay in Gigabit Ethernet is 4000 bit times.
6.	Fast Ethernet is the Successor of 10-Base-T Ethernet.	While Gigabit Ethernet is the successor of Fast Ethernet.